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California Natural Resources Agency,
9 *California Environmental Protection Agency, and*
10 *People of the State of California, ex rel. California*
Attorney General Rob Bonta

11
12 IN THE UNITED STATES DISTRICT COURT
13 FOR THE EASTERN DISTRICT OF CALIFORNIA
14

15 **THE CALIFORNIA NATURAL**
16 **RESOURCES AGENCY, ET AL.**

17 Plaintiffs,

18 v.

19 **GINA RAIMONDO, ET AL.,**

20 Defendants.
21
22

Case No. 1:20-cv-00426-DAD-EPG

**DECLARATION OF COLLEEN R.
FLANNERY IN SUPPORT OF MOTION
FOR INTERIM INJUNCTIVE RELIEF
AND TEMPORARY STAY OF
LITIGATION**

Date: February 1, 2022
Time: 9:30 a.m.
Dept: 5
Judge: The Honorable Dale A. Drozd
Trial Date: TBD
Action Filed: February 20, 2020

1
2 I, COLLEEN R. FLANNERY, hereby declare as follows:

3 1. I am a deputy attorney general with the California Attorney General's Office and
4 admitted before the state courts of California and the United States District Court for the Eastern
5 District of California. I represent Plaintiffs California Natural Resources Agency, California
6 Environmental Protection Agency, and People of the State of California by and through Rob
7 Bonta, Attorney General of the State of California (collectively, California) in this matter.

8 2. Attached to this Declaration as **Exhibit 1** is a true and correct copy of the Notice of
9 Deposition of Bradley Cavallo and Deposition Subpoena for Testimony and Production of
10 Documents, dated January 13, 2022.

11 3. Attached to this Declaration as **Exhibit 2** is a true and correct copy of excerpts from
12 the deposition transcript of Bradley Cavallo, taken on January 19, 2022, including the reporter's
13 certification.

14 4. Attached to this Declaration as **Exhibit 3** is a true and correct copy of Exhibit 6,
15 Bates-numbered P_CAVALLO_00063; Exhibit 11(no Bates number); and Exhibit 13, Bates-
16 numbered P_CAVALLO_00113, to the Cavallo deposition.

17 5. Attached to this Declaration as **Exhibit 4** is a true and correct copy of documents
18 Bates-numbered CAVALLO_002143-CAVALLO_002148, produced by Mr. Cavallo in response
19 to the Notice of Deposition and Subpoena.

20 6. Attached to this Declaration as **Exhibit 5** is a true and correct copy of a letter from
21 the California Department of Water Resources and the U.S. Bureau of Reclamation to the
22 California State Water Resources Control Board, dated January 18, 2022, available at
23 https://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/tucp/docs/2022/2022_0118_dwr-usbr-letter_tucp-withdrawal.pdf (last accessed January 24, 2022).
24

25 7. Attached to this Declaration as **Exhibit 6** is a true and correct copy of pages 49
26 (record page A_000080); 173 (record page A_000204); 510 (record page A_000541); 531 (record
27 page A_000562); and 761 (record page A_000792), of the 2019 NMFS BiOp.
28

1 I declare under penalty of perjury under the laws of the United States of America that the
2 foregoing is true and correct.

3 Executed this 24th day of January 2022 at Sacramento, California.

4
5 /s/ Colleen R. Flannery
6 Colleen R. Flannery
7 Deputy Attorney General

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Exhibit 1

ROB BONTA, State Bar No. 202668
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California Natural Resources Agency,
California Environmental Protection Agency, and
People of the State of California, ex rel. California
Attorney General Rob Bonta



IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF CALIFORNIA

**THE CALIFORNIA NATURAL
RESOURCES AGENCY, ET AL.**

Plaintiffs,

v.

GINA RAIMONDO, ET AL.,

Defendants.

Case No. 1:20-cv-00426-DAD-EPG

**NOTICE OF DEPOSITION OF
BRADLEY CAVALLO; DEPOSITION
SUBPOENA FOR TESTIMONY AND
PRODUCTION OF DOCUMENTS**

Judge: The Honorable Dale A. Drozd
Trial Date: Not set
Action Filed: February 20, 2020

TO ALL PARTIES AND THEIR ATTORNEYS OF RECORD:

PLEASE TAKE NOTICE that, pursuant to Rule 30 of the Federal Rules of Civil Procedure (FRCP) (Rule 30), Plaintiffs California Natural Resources Agency, California Environmental Protection Agency, and People of the State of California, ex rel. California Attorney General Rob Bonta (collectively, California Plaintiffs) will take the deposition of Bradley Cavallo in the above-captioned action, commencing at 9:30 a.m. on January 19, 2022.

1 The deposition will be conducted before a certified court reporter duly authorized to administer
2 oaths, be stenographically recorded, and will continue until completed consistent with Rule 30.

3 This deposition will be conducted remotely, and will be facilitated and administered via
4 Zoom by Veritext. The court reporter will administer the oath remotely and separately. The
5 procedures for attending the remote deposition are set forth below.

6 For any technical questions before or concerns during the deposition, attending participants
7 should contact Veritext at remote@veritext.com, or call (855) 440-4861.

8 1. Participants need to have a computer, laptop, or mobile device equipped with a webcam
9 and a high-speed, reliable internet connection.

10 2. The permanent link to these proceedings, including the Zoom link, is:
11 <https://proceedings.veritext.com/?token=12c1dd912cbdaabc219026240611518>. Participants are
12 advised that sharing this link with non-parties or unaffiliated individuals could affect the security
13 of the session.

14 3. If you would like to participate via Meeting ID/Password, video teleconference, or
15 conference call, click the link above within an hour of the scheduled start time, identify yourself,
16 and click **Show My Meeting ID/Password and Additional Session Details**.

17 4. Participants should be prepared to connect to audio via landline or mobile phone with
18 clear reception in order to achieve the best quality sound.

19 5. Participants should mute their microphone unless actively participating to reduce
20 interference, echo, and ambient noise.

21 A copy of California Plaintiffs' deposition subpoena to Bradley Cavallo is attached hereto
22 and served on January 13, 2022, via counsel along with this notice. Bradley Cavallo is required to
23 produce all documents, records, or other materials described in Exhibit A of the deposition
24 subpoena attached hereto. Production may be, to the extent practicable, accomplished by
25 electronic means.

26 PLEASE TAKE FURTHER NOTICE that the deposing party intends to cause the
27 proceedings to be recorded by video. If an interpreter is required, the undersigned must be
28

1 notified in writing at least 5 days before the deposition date of the language spoken by the
2 deponent.

3
4 Dated: January 13, 2022

Respectfully submitted,

5 ROB BONTA
Attorney General of California

6
7 */S/ Tracy L. Winsor*
TRACY L. WINSOR
Supervising Deputy Attorney General
8 *Attorneys for Plaintiffs California Natural*
Resources Agency, California
9 *Environmental Protection Agency, and*
10 *People of the State of California, ex rel.*
California Attorney General Rob Bonta

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UNITED STATES DISTRICT COURT

for the

Eastern District of California

California Natural Resources Agency, et al.

Plaintiff

v.

Gina Raimondo, et al.

Defendant

Civil Action No. 1:20-cv-00431-DAD-EPG
1:20-cv-00426-DAD-EPGL

SUBPOENA TO TESTIFY AT A DEPOSITION IN A CIVIL ACTION

To: Bradley Cavallo

(Name of person to whom this subpoena is directed)

☒ **Testimony:** YOU ARE COMMANDED to appear at the time, date, and place set forth below to testify at a deposition to be taken in this civil action. If you are an organization, you must promptly confer in good faith with the party serving this subpoena about the following matters, or those set forth in an attachment, and you must designate one or more officers, directors, or managing agents, or designate other persons who consent to testify on your behalf about these matters:

Place: Zoom, available at <https://proceedings.veritext.com/?token=12c1dd912cbdaabc219026240611518>

Date and Time:
01/19/2022 9:30 am

The deposition will be recorded by this method: Stenographically and by video

☒ **Production:** You, or your representatives, must also bring with you to the deposition the following documents, electronically stored information, or objects, and must permit inspection, copying, testing, or sampling of the material:

See Exhibit A (attached)

The following provisions of Fed. R. Civ. P. 45 are attached – Rule 45(c), relating to the place of compliance; Rule 45(d), relating to your protection as a person subject to a subpoena; and Rule 45(e) and (g), relating to your duty to respond to this subpoena and the potential consequences of not doing so.

Date: 01/13/2022

CLERK OF COURT

OR

/s/ Tracy Winsor

Signature of Clerk or Deputy Clerk

Attorney's signature

The name, address, e-mail address, and telephone number of the attorney representing *(name of party)* Plaintiffs California Natural Resources Agency, et al., who issues or requests this subpoena, are:

Tracy Winsor, Office of the California Attorney General, 1300 I Street, Ste. 125, Sacramento, CA 95814, (916) 210-7796
Tracy.Winsor@doj.ca.gov

Notice to the person who issues or requests this subpoena

If this subpoena commands the production of documents, electronically stored information, or tangible things before trial, a notice and a copy of the subpoena must be served on each party in this case before it is served on the person to whom it is directed. Fed. R. Civ. P. 45(a)(4).

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Civil Action No. _____

PROOF OF SERVICE

(This section should not be filed with the court unless required by Fed. R. Civ. P. 45.)

I received this subpoena for *(name of individual and title, if any)* Bradley Cavallo
on *(date)* 01/13/2022 .

☐ I served the subpoena by delivering a copy to the named individual as follows: _____

_____ on *(date)* _____ ; or

☐ I returned the subpoena unexecuted because: _____

Unless the subpoena was issued on behalf of the United States, or one of its officers or agents, I have also
tendered to the witness the fees for one day's attendance, and the mileage allowed by law, in the amount of
\$ _____ .

My fees are \$ _____ for travel and \$ _____ for services, for a total of \$ 0.00 .

I declare under penalty of perjury that this information is true.

Date: _____
_____ *Server's signature*

Printed name and title

Server's address

Additional information regarding attempted service, etc.:

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Federal Rule of Civil Procedure 45 (c), (d), (e), and (g) (Effective 12/1/13)**(c) Place of Compliance.**

(1) For a Trial, Hearing, or Deposition. A subpoena may command a person to attend a trial, hearing, or deposition only as follows:

- (A) within 100 miles of where the person resides, is employed, or regularly transacts business in person; or
- (B) within the state where the person resides, is employed, or regularly transacts business in person, if the person
 - (i) is a party or a party's officer; or
 - (ii) is commanded to attend a trial and would not incur substantial expense.

(2) For Other Discovery. A subpoena may command:

- (A) production of documents, electronically stored information, or tangible things at a place within 100 miles of where the person resides, is employed, or regularly transacts business in person; and
- (B) inspection of premises at the premises to be inspected.

(d) Protecting a Person Subject to a Subpoena; Enforcement.

(1) Avoiding Undue Burden or Expense; Sanctions. A party or attorney responsible for issuing and serving a subpoena must take reasonable steps to avoid imposing undue burden or expense on a person subject to the subpoena. The court for the district where compliance is required must enforce this duty and impose an appropriate sanction—which may include lost earnings and reasonable attorney's fees—on a party or attorney who fails to comply.

(2) Command to Produce Materials or Permit Inspection.

(A) *Appearance Not Required.* A person commanded to produce documents, electronically stored information, or tangible things, or to permit the inspection of premises, need not appear in person at the place of production or inspection unless also commanded to appear for a deposition, hearing, or trial.

(B) *Objections.* A person commanded to produce documents or tangible things or to permit inspection may serve on the party or attorney designated in the subpoena a written objection to inspecting, copying, testing, or sampling any or all of the materials or to inspecting the premises—or to producing electronically stored information in the form or forms requested. The objection must be served before the earlier of the time specified for compliance or 14 days after the subpoena is served. If an objection is made, the following rules apply:

- (i) At any time, on notice to the commanded person, the serving party may move the court for the district where compliance is required for an order compelling production or inspection.
- (ii) These acts may be required only as directed in the order, and the order must protect a person who is neither a party nor a party's officer from significant expense resulting from compliance.

(3) Quashing or Modifying a Subpoena.

(A) *When Required.* On timely motion, the court for the district where compliance is required must quash or modify a subpoena that:

- (i) fails to allow a reasonable time to comply;
- (ii) requires a person to comply beyond the geographical limits specified in Rule 45(c);
- (iii) requires disclosure of privileged or other protected matter, if no exception or waiver applies; or
- (iv) subjects a person to undue burden.

(B) *When Permitted.* To protect a person subject to or affected by a subpoena, the court for the district where compliance is required may, on motion, quash or modify the subpoena if it requires:

(i) disclosing a trade secret or other confidential research, development, or commercial information; or

(ii) disclosing an unretained expert's opinion or information that does not describe specific occurrences in dispute and results from the expert's study that was not requested by a party.

(C) *Specifying Conditions as an Alternative.* In the circumstances described in Rule 45(d)(3)(B), the court may, instead of quashing or modifying a subpoena, order appearance or production under specified conditions if the serving party:

- (i) shows a substantial need for the testimony or material that cannot be otherwise met without undue hardship; and
- (ii) ensures that the subpoenaed person will be reasonably compensated.

(e) Duties in Responding to a Subpoena.

(1) Producing Documents or Electronically Stored Information. These procedures apply to producing documents or electronically stored information:

(A) *Documents.* A person responding to a subpoena to produce documents must produce them as they are kept in the ordinary course of business or must organize and label them to correspond to the categories in the demand.

(B) *Form for Producing Electronically Stored Information Not Specified.* If a subpoena does not specify a form for producing electronically stored information, the person responding must produce it in a form or forms in which it is ordinarily maintained or in a reasonably usable form or forms.

(C) *Electronically Stored Information Produced in Only One Form.* The person responding need not produce the same electronically stored information in more than one form.

(D) *Inaccessible Electronically Stored Information.* The person responding need not provide discovery of electronically stored information from sources that the person identifies as not reasonably accessible because of undue burden or cost. On motion to compel discovery or for a protective order, the person responding must show that the information is not reasonably accessible because of undue burden or cost. If that showing is made, the court may nonetheless order discovery from such sources if the requesting party shows good cause, considering the limitations of Rule 26(b)(2)(C). The court may specify conditions for the discovery.

(2) Claiming Privilege or Protection.

(A) *Information Withheld.* A person withholding subpoenaed information under a claim that it is privileged or subject to protection as trial-preparation material must:

- (i) expressly make the claim; and
- (ii) describe the nature of the withheld documents, communications, or tangible things in a manner that, without revealing information itself privileged or protected, will enable the parties to assess the claim.

(B) *Information Produced.* If information produced in response to a subpoena is subject to a claim of privilege or of protection as trial-preparation material, the person making the claim may notify any party that received the information of the claim and the basis for it. After being notified, a party must promptly return, sequester, or destroy the specified information and any copies it has; must not use or disclose the information until the claim is resolved; must take reasonable steps to retrieve the information if the party disclosed it before being notified; and may promptly present the information under seal to the court for the district where compliance is required for a determination of the claim. The person who produced the information must preserve the information until the claim is resolved.

(g) Contempt.

The court for the district where compliance is required—and also, after a motion is transferred, the issuing court—may hold in contempt a person who, having been served, fails without adequate excuse to obey the subpoena or an order related to it.

EXHIBIT A

Pursuant to Rule 30 of the Federal Rules of Civil Procedure, California Plaintiffs command deponent Bradley Cavallo to produce all documents described below on or before January 19, 2022. California Plaintiffs make this request without prejudice to their right to inspect the originals at a later date.

DEFINITIONS

1. As used herein, the term “DOCUMENTS” should be understood to have the full meaning given in Rule 34(a)(1)(A) of the Federal Rules of Civil Procedure, and shall include, but not be limited to, all writings of any kind or nature whatsoever in their actual or constructive possession, custody, care, or physical control, including without limitation correspondence, memoranda, agreements, messages, notes, contracts, or extracts, or excerpts for any of the following Document Requests, excepting those documents which are expressly protected from disclosure pursuant to Rules 26(b)(4)(B) and 26(b)(4)(C), et seq.

2. As used herein, the terms “YOU” and “YOUR” shall refer to Bradley Cavallo.

INSTRUCTIONS

1. YOU are requested to produce not only those DOCUMENTS in YOUR possession, custody or control, but also those DOCUMENTS reasonably available to YOU, including those in the possession, custody or control of YOUR attorneys, agents, or other persons acting on YOUR behalf. YOU are also requested to produce DOCUMENTS in the form in which they are kept in the usual course of business, or to organize and label them to correspond with the categories in this request.

2. YOUR obligation at the commencement of litigation, YOU are obligated to take all necessary steps to prevent alteration, modification, or deletion, of all responsive Electronically Stored Information (ESI) in YOUR possession, custody, or control, including but not limited to the native files and all metadata related to the ESI. YOU are required to make a diligent search of all devices and media capable of containing ESI within YOUR possession, custody, or control, including but not limited to computers, servers, networks, cloud-based storage, back-up media, thumb drives, smartphones, PDAs, mobile devices, tablet computers.

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1 storage media, hard drives, social media accounts, and every medium in which ESI may be
2 located to determine if any ESI responsive to the individual requests is present. If any ESI is
3 responsive and non-privileged, it is required to be produced in native format together with all
4 metadata, attachments, and other related ESI unmodified, and intact. Any other non-privileged
5 responsive DOCUMENTS maintained in electronic form must also be produced. ESI shall be
6 produced as follows:

- 7 a. All ESI shall be collected, processed and produced in a manner that ensures that all
8 files reflect the accurate metadata associated with the creation and maintenance of the
9 files and is not corrupted or altered by the methods of the collection of the data.
10 Further, all ESI shall be produced in a manner to indicate the custodian of the ESI. All
11 ESI shall be made accessible for review by “unhiding” any information hidden in the
12 ESI, or by providing passwords necessary to access the ESI, or by any other means
13 necessary to permit the ESI to be reviewed completely.
- 14 b. All ESI shall be produced in its native format. Note that any ESI, regardless of format,
15 must not be redacted in the native format to avoid spoliation of evidence. If ESI
16 requires proprietary software to read the native files, then versions not requiring the
17 proprietary software to read shall be produced in addition to the native files.
- 18 c. Spreadsheets shall be produced in native format (e.g., as .XLS files) including related
19 searchable text, metadata, formulas, and other information intact and unchanged. All
20 hidden information shall be unhidden or otherwise made available for review.
- 21 d. Presentations, such as those created in Microsoft PowerPoint or similar programs,
22 shall be produced in native full slide image format along with speaker notes, with any
23 speaker notes following the full images of the slides with related searchable text and
24 metadata and other information intact and unchanged. Presentations shall also be
25 produced in native format (e.g., as .PPT files).
- 26 e. If YOU wish to produce ESI post-processing, the documents shall be processed in a
27 manner that preserves the original ESI in an unaltered state, including all metadata and
28 other related information. Processed electronic documents shall be provided in a

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1 single-page .tif format with corresponding load files. The load files shall include an
2 ASCII delimited load file containing the metadata associated with the file, the text
3 extracted from the native file, and a directory path to the native file. Contact counsel
4 for Requesting Party for further information regarding formatting of processed
5 electronically stored information.

6 f. Electronic mail shall be produced in a .pst file native to Microsoft Outlook, with the
7 metadata in an unaltered state. All necessary passwords to access all emails,
8 attachments, and metadata relating to the .pst file shall also be produced. Contact
9 counsel for Requesting Party for further information regarding formatting of processed
10 electronically stored information.

11 g. If there are multiple formats in which to produce ESI to Requesting Party, and the
12 above guidelines do not address which format ESI must be produced, YOU shall
13 contact counsel for Requesting Party to meet and confer regarding the proper
14 production format.

15 3. If YOU claim that the attorney-client privilege, the attorney work-product doctrine, or any
16 other privilege is applicable to any DOCUMENTS, production of which are sought by this
17 request, the substance of those DOCUMENTS need not be disclosed in YOUR answers, but YOU
18 shall, with respect to those DOCUMENTS provide a privilege log with at least the following
19 information:

- 20 a. State the date of the DOCUMENTS;
- 21 b. Identify each and every author of the DOCUMENTS;
- 22 c. Identify each and every other person who prepared or participated in the preparation of
23 the DOCUMENTS;
- 24 d. Identify each and every person who received the DOCUMENTS;
- 25 e. Identify each and every person from whom the DOCUMENTS were received;
- 26 f. State the present location of the DOCUMENTS and all copies thereof;
- 27 g. Identify each and every person having custody or control of the DOCUMENTS and all
28 copies thereof; and

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1 h. Provide sufficient further information concerning the DOCUMENTS and the
2 circumstances thereof to explain the claim of privilege and to permit the adjudication
3 of the propriety of that claim.

4 4. In the event YOU are able to produce only some of the DOCUMENTS called for in a
5 particular request, please produce all the DOCUMENTS YOU are able to and state the reasons
6 for YOUR inability to produce the remainder.

7 5. If YOU object to a portion of a request, please produce all DOCUMENTS called for by that
8 portion of the request to which YOU do not object.

9 6. When YOU produce the DOCUMENTS requested herein for inspection and photocopying,
10 YOU are to identify the DOCUMENTS produced by reference to the number of the Request.

11 **REQUESTS FOR PRODUCTION**

12 1. YOUR complete file in connection with YOUR investigation and evaluation of the issues
13 involved in the LITIGATION, including but not limited to:

- 14 a. all DOCUMENTS furnished to YOU by anyone; and
15 b. all DOCUMENTS obtained or created by YOU.

16 2. All DOCUMENTS, including, but not limited to, posts to social media which YOU have
17 considered in reaching the opinions or conclusions that YOU have or will testify on in the
18 LITIGATION, including, but not limited to, opinions and conclusions in YOUR
19 DECLARATION.

20 3. All DOCUMENTS, including, but not limited to, website content, blog posts, emails, text
21 messages, and social media posts and replies, exchanged between YOU and any other person
22 concerning the LITIGATION between April 1, 2021 and January 13, 2022.

23 4. Any and all DOCUMENTS which constitute a contract or agreement between YOU and
24 any PARTY with respect to the LITIGATION.

25 5. Any and all timekeeping, billing, and payment records regarding the work performed by
26 YOU with respect to the LITIGATION.

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28 **P_CAVALLLO_00010**

DECLARATION OF SERVICE BY E-MAIL

Case Name: **California Natural Resources Agency, et al. v. Gina Raimondo, et al.**
No.: **1:20-cv-00426-DAD-EPG**

I declare:

I am employed in the Office of the Attorney General, which is the office of a member of the California State Bar, at which member's direction this service is made. I am 18 years of age or older and not a party to this matter.

On January 13, 2022, I served the attached **NOTICE OF DEPOSITION OF BRADLEY CAVALLO; DEPOSITION SUBPOENA FOR TESTIMONY AND PRODUCTION OF DOCUMENTS** by transmitting a true copy via electronic mail to the following person(s) or representative(s) at the email address(es) listed on the attached service list.

PLEASE SEE ATTACHED EMAIL SERVICE LIST

I declare under penalty of perjury under the laws of the State of California and the United States of America the foregoing is true and correct and that this declaration was executed on January 13, 2022, at Sacramento, California.

Valerie A. Tamulevich

Declarant

/s/ Valerie A. Tamulevich

Signature

P_CAVALLO_00011

Email Service List

ack@vnf.com;
aclark@downeybrand.com;
agabu@vnf.com;
ahitchings@somachlaw.com;
akhalifa@vnf.com;
amcadam@vnf.com;
bchisholm@altshulerberzon.com;
bhamilton@downeybrand.com;
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P_CAVALLO_00012

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kroberson@fresnocountyca.gov;
lcoffman@caed.uscourts.gov;
lesley.lawrence-hammer@usdoj.gov;
leticia.aguirre@doj.ca.gov;
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lori.caramanian@sol.doi.gov;
madams@kaplankirsch.com;
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mbyrne@altshulerberzon.com;
mhernandez@caed.uscourts.gov;
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ncollins@altshulerberzon.com;
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romney.philpott@usdoj.gov;
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Exhibit 2

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF CALIFORNIA

---000---

THE CALIFORNIA NATURAL
RESOURCES AGENCY, ET
AL.,

Plaintiffs,

vs.

Case No.

1:20-cv-00426-DAD-EPG

GINA RAIMONDO, ET AL.,
Defendants.

_____/

VIRTUAL ZOOM DEPOSITION OF BRADLEY CAVALLO

January 19, 2022

Taken before EARLY K. LANGLEY RMR, RSA, B.A.

CSR No. 3537

Page 1

DEPOSITION OF BRADLEY CAVALLLO

BE IT REMEMBERED, that pursuant to Notice and Subpoena, and on January 19, 2022, commencing at the hour of 9:35 a.m., before me, EARLY LANGLEY, a Certified Shorthand Reporter, State of California, via Virtual Zoom appeared BRADLEY CAVALLLO, produced as a witness in said action, and being by me first duly sworn, was thereupon examined as a witness in said cause.

---oOo---

APPEARANCES VIA VIRTUAL ZOOM:

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4 River Garden Farms Water Company; Pleasant Grove-Verona
5 Mutual Water Company; Pelger Mutual Water Company;
6 Meridian Farms Water Company; Henry D. Richter, et al.;
7 Howald Farms, Inc., Oji Brothers Farm, Inc.; Oji Family
8 Partnership, Carter Mutual Water Company; Windswept
9 Land and Livestock Company; Maxwell Irrigation
10 District; Beverly F. Andreotti, et al.; Tisdale
11 Irrigation and Drainage Company; Provident Irrigation
12 District; and Princeton-Codora-Glenn Irrigation
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12 Also present:

13 ERIC DANNER, PH.D.

14 JENNIFER BUCKMAN

15 CHRISTOPHER KEIFER

16 BECKY SHEEHAN

17 DEANNA SERENO

18 BRUCE HERBOLD, PH.D.

1 Environmental Protection Agency, and People of the
2 State of California, ex rel. Attorney General Rob
3 Bonta.

4 THE REPORTER: Mr. Mueller?

5 MR. MUELLER: Yes, my name is Jared Mueller. I
6 represent the Sacramento River Intervenors. I'm with
7 Somach Simmons & Dunn and also agree to your statement
8 put before.

9 BRADLEY CAVALLO

10 sworn as a witness,

11 testified as follows:

12 THE REPORTER: Thank you.

13 Go ahead, Counsel.

14 MS. WINSOR: Thank you, Madam Court Reporter.

15 Just to clarify on the record since there are a
16 number of separately represented parties here, I just
17 want to ask any party that has any disagreement to the
18 proceedings occurring remotely to please state it now.
19 If I don't hear any disagreement, we will all infer
20 that everyone agrees.

21 Hearing none.

22 EXAMINATION BY MS. WINSOR:

23 Q. Good morning, Mr. Cavallo. How are you today?

24 A. Good. Thank you.

25 Q. Excellent.

1 Cramer Fish Sciences?

2 A. Correct.

3 Q. So you've done some work on this case; true?

4 A. Yes.

5 Q. And Cramer has received some money for that
6 work; true?

7 A. Yes.

8 Q. Do you know how much money Cramer has received
9 for that work?

10 A. I -- I don't. We're billing our hours at, you
11 know, our standard rates. There has been a lot of
12 activity since the work began, you know, reviewing
13 filings, so I would -- I could make an estimate, if
14 that's what you are looking for.

15 Q. Yes.

16 A. \$40,000.

17 Q. So you would estimate \$40,000 for the work that
18 you've done on this case has been paid to Cramer. Is
19 that for you alone or you and other people?

20 A. That's -- that's for Cramer Fish Sciences, and
21 that is based on the last invoice that I reviewed that
22 went through December. So there would be some
23 additional charges associated with work done in January
24 that I have not seen.

25 Q. All right. To clarify, you believe that Cramer

1 interested in in Celsius?

2 BY MS. WINSOR:

3 Q. Yeah. So in Farenheit, please -- you can
4 convert it, if you need to -- what range of
5 temperature-dependent mortality do you -- is your
6 opinion that -- from the start is this showing at
7 approximately 53 degrees?

8 I would like to walk through this one degree at
9 a time -- actually, half a degree at a time.

10 A. 53 degrees? Is that what I heard?

11 Q. Yes.

12 A. So I would say that temperature, at 53, that
13 the range of temperature-dependent mortality ranges
14 from zero to about 40 percent.

15 Q. And what about at 53.5 degrees? Are you able
16 to estimate that for me?

17 A. About 0 to 60 percent.

18 MR. MUELLER: I'm going to object to this line
19 of questioning, using this table, to the extent that
20 Mr. Cavallo did not prepare it, we are not using
21 precise figures here, and he's eyeballing.

22 BY MS. WINSOR:

23 Q. What about 54 degrees?

24 A. 54 looks like it's about 0 to 73 percent.

25 Q. What about 55 degrees?

1 A. That's about 0 to 87 percent.

2 Q. And then together, we've estimated -- or you've
3 estimated, and I have made a note, that the outer
4 boundary of this blue area would be approximately
5 56.6 degrees Farenheit; correct?

6 MR. MUELLER: Mischaracterizes prior testimony.
7 Vague. Calls for speculation. Document speaks for
8 itself.

9 BY MS. WINSOR:

10 Q. What about at 56.5 degrees Farenheit? What
11 would you estimate the range of temperature-dependent
12 mortality?

13 MR. MUELLER: Same objections.

14 THE WITNESS: 56.5?

15 BY MS. WINSOR:

16 Q. I'm attempting to use what I understood to be
17 the approximate outer boundary of your blue area here,
18 which you, I think, said 13.7 degrees Celsius. And
19 rough conversion on that would be about 56.6 degrees
20 Farenheit; correct?

21 MR. MUELLER: Vague.

22 THE WITNESS: Yes, 56.5 is 13.6 degrees
23 Celsius.

24 BY MS. WINSOR:

25 Q. All right.

1 A. Do you want me --

2 Q. What about at that temperature? What would you
3 expect the range of temperature-dependent mortality to
4 be?

5 MR. MUELLER: Vague. Mischaracterizes prior
6 testimony.

7 THE WITNESS: Looks like zero percent mortality
8 up to, you know, 99 percent.

9 BY MS. WINSOR:

10 Q. And what about at 57 degrees?

11 MR. MUELLER: Same objections.

12 THE WITNESS: That looks like the temperature-
13 dependent mortality would be maybe 85 to 100 percent.

14 BY MS. WINSOR:

15 Q. So using this chart and your calculations, it
16 is certain that temperature-dependent mortality at
17 57 degrees or above would range from a minimum of
18 85 percent up to what appears to be 100 percent; true?

19 MR. MUELLER: Objection -- same objections.
20 Calls for speculation. It's vague as to his
21 calculations, which are eyeballing based on Figure 9
22 that he did not craft.

23 MS. WINSOR: Counsel, I would like to ask that
24 you not make speaking objections. If you have an
25 objection, please state it. Please don't speak.

1 MR. MUELLER: To the extent you would not want
2 me to clarify why it's vague, I won't. I'll just
3 interpose that it's vague, then.

4 MS. WINSOR: Thank you.

5 Could I have a read-back on that question.

6 MR. MUELLER: Can you repeat the question.

7 MS. WINSOR: Thank you.

8 (Record read by the court reporter.)

9 THE WITNESS: That is what the figure depicts.

10 I would add that this is not reality. This is
11 the Martin model, and there is a lot of issues
12 underlying even this about whether that's completely
13 accurate or not. Probably is not.

14 BY MS. WINSOR:

15 Q. Does your --

16 I'm sorry, Mr. Cavallo. I didn't mean to step
17 on you. What were you saying?

18 A. I'm -- I'm good.

19 Q. I apologize for stepping on you. I thought you
20 were finished.

21 A. I'm finished.

22 Q. Do you agree that if there is as much potential
23 loss as is predicted in Figure 9 at lower temperatures
24 and great certainty of high temperature-dependent
25 mortality at higher temperatures, that is prudent to

1 manage temperature in a manner that is protective of
2 species as temperatures increase?

3 MR. MUELLER: Vague. Outside the scope.

4 THE WITNESS: So what I would say -- and this
5 is something I described in more detail in my
6 declaration -- is that if cold water supply is not
7 limiting, then yes, you might choose a colder
8 temperature to be more conservative.

9 But in practice, cold water supply is limiting,
10 so there is a need to try and identify what -- what the
11 right temperature is that allows you to, you know, have
12 reasonably good survival of incubating eggs while also
13 being able to maintain that temperature throughout the
14 incubation period. There is a risk of going colder
15 than needed and then running out of cold water.

16 That's my observation and also on the basis of
17 reviewing the declarations of Mr. Deas and Mr. Bergfeld
18 about the challenges of managing cold water pool.

19 Q. The cold water is not going to hurt the
20 species; correct?

21 MR. MUELLER: That's vague. Calls for a legal
22 conclusion.

23 THE WITNESS: Yeah, I'm not aware of any
24 information that suggests that colder water
25 temperatures, you know, down certainly to, you know,

1 54, 53 are going to be harmful to winter-run.

2 There is scientific literature that has
3 expressed concern about that, how that adversely
4 affects another endangered species like green sturgeon.

5 BY MS. WINSOR:

6 Q. I would like to turn back to Exhibit 2 of your
7 declaration -- sorry -- Exhibit 2, which is your
8 declaration minus exhibits.

9 And if you have that in hard copy, feel free to
10 refer to the hard copy that you have. And I am going
11 to go to paragraph 74, if you could refer to that with
12 me.

13 In paragraph 74, you state that "Laboratory
14 studies conducted by the USFWS" -- the U.S. Fish and
15 Wildlife Service -- "provide the best available
16 scientific information to inform management of
17 Sacramento River water temperatures during egg
18 incubation. It might be argued that poor ETF" --

19 Meaning egg-to-fry; correct?

20 A. Correct.

21 Q. -- "ETF survival observed in 2014, 2015, and
22 2021 demonstrates that the 56-degree F standard is
23 inadequately protective."

24 Have I read that correctly?

25 A. Yes.

1 Q. What did you mean when you said "the 56-degree
2 Farenheit standard"?

3 A. Well, the 56 degrees was the standard, trying
4 to keep temperatures below -- at or below that level
5 prior to the 2014-'15 drought. And the basis for that
6 was that U.S. Fish and Wildlife Service 1999 study.

7 Q. When you say in this part of your declaration
8 that "It might be argued that poor ETF survival
9 observed in 2014, 2015, and 2021 demonstrates that the
10 56-degree standard is inadequately protective," does
11 that mean, in your mind, that reasonable people could
12 consider the same data and conclude that management at
13 temperatures below 56 degrees is necessary to reduce
14 the risk of poor egg-to-fry survival observed in 2014,
15 2015, and 2021?

16 MR. MUELLER: Objection. Vague. Incomplete
17 hypothetical.

18 THE WITNESS: I understood the question to be,
19 is it reasonable to conclude that temperatures at or
20 below 56 are needed for, you know, good egg incubation
21 survival?

22 And I agree. I think that's true, based on the
23 information we have.

24 BY MS. WINSOR:

25 Q. And, in fact, that is what the NMFS concluded

1 in the 2019 BiOp; true?

2 A. Yeah, I don't -- I don't know that that was
3 specifically concluded in the NMFS BiOp, I know the
4 56-degree standard was part of their criteria for
5 Tier 3 and Tier 4 years.

6 MS. WINSOR: I'd like to mark -- actually, I'm
7 just going to show it -- no, I'm going to mark it.

8 Are we on Exhibit 5 now? We're on Exhibit 6.

9 I'd like to mark as Exhibit 6 --

10 And, Colleen, if you could please email it to
11 all counsel.

12 -- the excerpt of the BiOps.

13 (Whereupon, Plaintiffs' Exhibit 6 was marked
14 for identification.)

15 BY MS. WINSOR:

16 Q. Mr. Cavallo, I will represent to you that this
17 exhibit is a screenshot taken of page 54 of the
18 National Marine Fisheries Service 2019 BiOp.

19 Have you seen this part of this document
20 before?

21 A. I have.

22 Q. And there are tiers provided for on this page
23 of the document; correct?

24 A. Yes.

25 Q. And in Tier 3, it reads, "Targets 53.5 to

1 Q. But from a species-protection perspective, just
2 based on science, you don't dispute that range;
3 correct?

4 MR. MUELLER: Vague.

5 THE WITNESS: I -- I dispute the range because
6 of the consequences of trying to manage to it. It's an
7 area of uncertainty, how much mortality occurs between
8 53.5 and 56.

9 The U.S. Fish and Wildlife Service study
10 suggests that temperature-related mortality is pretty
11 low below 56, and so the fine point of the temperature
12 to manage to there just isn't an area we have a lot of
13 clarity on right now.

14 The Martin model suggests a lower standard, but
15 as I've described previously in detail in my
16 declaration and in the exhibits, there's a lot of
17 questions about how much we can really distinguish.

18 So it may very well be that -- that survival --
19 egg incubation survival is reasonably good at 56 and
20 that you would be wasting cold water pool trying to
21 maintain it at 54.

22 MS. WINSOR: I didn't -- I move to strike,
23 because I didn't ask you the question based off of
24 operational concerns.

25 BY MS. WINSOR:

1 isolate the effect of temperature on eggs and hatching?

2 MR. MUELLER: Vague. Calls for a legal
3 conclusion.

4 THE WITNESS: So that may be the stated intent,
5 but that's a problem, because we know those things are
6 not constant; we know there are other sources of
7 mortality other than temperature-related mortality that
8 occurs during egg incubation.

9 MS. WINSOR: And we'll talk about those later.
10 For now, I think I asked a yes-or-no question.
11 Could I have the question read back.

12 (Record read by the court reporter.)

13 MS. WINSOR: And that should read "eggs and
14 hatching," actually.

15 THE REPORTER: Thank you.

16 BY MS. WINSOR:

17 Q. Do you understand the question, Mr. Cavallo?

18 A. I do. It's not a -- it's not a "yes" or
19 "no" -- it's not a question that can be answered with a
20 "yes" or "no."

21 Q. I have to disagree. The question is, does it
22 assume that all other factors are constant to isolate
23 the effect of temperature on eggs and hatching?

24 A. Correct. But implicit in that is the
25 assumption that it's valid to do that. And I don't

1 So it's not reasonable to just pick a lower
2 number because it's, you know, lower. It may have
3 consequences for the species. And that's part of the
4 application of science to these management issues, is
5 understanding, you know, benefits and risks.

6 Q. Is it your opinion that managing at 55 degrees
7 or 54 degrees will have negative consequence for the
8 winter-run Chinook?

9 MR. MUELLER: Objection. Vague. Calls for a
10 legal conclusion.

11 THE WITNESS: It could.

12 BY MS. WINSOR:

13 Q. How?

14 A. If -- if it was -- if it was not achieved as
15 prescribed.

16 Q. I think you're introducing facts into my
17 question that I didn't include.

18 So let's go back to this document. We are now
19 looking, again, at Exhibit 6, which is the excerpt of
20 the 2019 Biological Opinions. Do you see that
21 document?

22 A. Yes.

23 Q. "Yes"?

24 A. Yes.

25 Q. And earlier, you agreed that management

1 that is Exhibit 2. This is, again, the declaration
2 minus the exhibits.

3 In paragraph 15 -- and apologize for scrolling
4 while sharing the screen because that is not easy on
5 the eyes.

6 So if you want to look at the hard copy,
7 Mr. Cavallo, I'm turning to -- it's document page 7,
8 PDF page 8. On the exhibit, it's Bates-numbered
9 P_CAVALLO_22, for the record.

10 Paragraph 15 talks about water temperature and
11 dissolved -- oxygen; true?

12 A. Yes.

13 Q. There is a relationship between water
14 temperature and dissolved oxygen; true?

15 A. Correct.

16 Q. Can you explain that relationship, please, with
17 reference to your declaration or otherwise?

18 A. Yeah. So colder water will hold -- dissolved
19 oxygen has a saturation point in the water, and colder
20 water can hold somewhat more dissolved oxygen than
21 warmer water.

22 Q. All right. And paragraph 17 of your
23 declaration, if you want to turn to that? I'm
24 screen-sharing it, for the record. And that paragraph
25 appears on page -- document page 8, PDF page 9, Bates

1 A. Yes.

2 Q. All right. My question about that sentence was
3 whether Figure 9, which we looked at earlier together
4 in Exhibit 5, which I am now screen-sharing -- whether
5 the -- Figure 9 shows the results of the analysis
6 described in paragraph 61.

7 A. You're not sharing a figure right now.

8 Q. Can you now see Figure 9?

9 A. Yes, I see it now.

10 Q. And the question was --

11 A. I'm sorry. The question?

12 Q. The question is, in paragraph 61, you say, "We
13 used code to develop appropriate confidence intervals
14 for TDM and while doing so identified serious problems
15 that have not previously been disclosed or considered."

16 And my question was, does Figure 9 show the
17 results of your use of code to develop appropriate
18 confidence intervals, as described in paragraph 61?

19 A. It -- it does describe the generation of
20 confidence intervals. It isn't getting at the other
21 problems that are alluded to in paragraph 61.

22 MS. WINSOR: I am going to mark now another
23 document momentarily.

24 (Whereupon, Plaintiffs' Exhibit 9 was marked
25 for identification.)

1 And the detailed methods for estimating the
2 parameters that compose the Martin model was really not
3 well described in that -- in that paper, was not part
4 of the paper or the supplementary materials.

5 Q. So focusing in on the question, response was
6 explanation, which you are fully welcome to give, "Yes,
7 it has been peer-reviewed"; correct?

8 MR. MUELLER: Mischaracterizes prior testimony.

9 THE WITNESS: There is a publication that has
10 gone through peer review, but that doesn't necessarily
11 mean that everything in the publication has been
12 reviewed in the manner that it should be.

13 BY MS. WINSOR:

14 Q. Is this litigation the first time that you have
15 ever provided an opinion regarding the Martin model?

16 A. No.

17 Q. When did you first offer an opinion regarding
18 the Martin model?

19 MR. MUELLER: Vague.

20 THE WITNESS: Assuming that you mean a formal
21 opinion in a legal setting, and I believe that would be
22 the NRDC litigation in 2018 in my expert report for
23 that.

24 BY MS. WINSOR:

25 Q. And there have been responses to the opinions

1 A. I don't -- I don't think that that's -- that it
2 was programmed in that way deliberately. And I don't
3 even think that's how it -- how it works.

4 I think the model -- the model provides results
5 that have been misinterpreted and misunderstood because
6 there hasn't been enough discussion about how the --
7 how the model was developed and the parameter estimates
8 that it provides.

9 Q. Was this Technical Memorandum the first time
10 that you raised concerns regarding the frequentist
11 methods in the Martin model to NMFS?

12 A. Well, that's a little bit difficult to answer
13 because we did not -- we originally requested the
14 frequentist code in October, and we didn't receive
15 that. We received the Bayesian code.

16 And then it wasn't until December 17th that we
17 received the frequentist code with the statement that
18 that was the code that the science center was relying
19 on for estimating TDM.

20 So it was only after that and working with that
21 code that we, you know, found what we did with it.

22 Q. And prior to the discussion and response
23 described in this Technical Memorandum, have you
24 previously raised other concerns regarding the Martin
25 model with NMFS?

1 A. Yes.

2 Q. And did you get a response to those concerns?

3 A. Not a response that -- that was constructive,
4 no.

5 Q. You got a response, though; correct?

6 A. Well, a nonconstructive response isn't -- isn't
7 a good response, in my view.

8 Q. Is it fair to say that reasonable scientists
9 can disagree about the data points that you have
10 presented in your prior communications with NMFS?

11 MR. MUELLER: Vague.

12 THE WITNESS: Yeah, I think -- I think there
13 can be reasonable interpretations and discussion of the
14 methodology and the consequences. That hasn't
15 happened, and that's part of the problem, you know.

16 I -- it's my opinion, having reviewed this
17 stuff pretty carefully and worked with Alex, that these
18 are serious issues, that there isn't a -- there isn't
19 an answer that involves that you're wrong -- or that
20 we're wrong and there's nothing here and that the
21 Martin model is appropriate for estimating temperature-
22 dependent mortality with -- or Tcrit with the precision
23 with which it's been applied to management problems.

24 I don't -- I don't see that being an outcome of
25 that kind of a discussion. We just haven't had that

1 Q. Why did you choose those years for the data
2 used to prepare this table?

3 A. Are you referring to the fact that I excluded,
4 like, three or four years?

5 Q. Yes.

6 A. Yeah, it is explained in the figure caption,
7 but what I was trying to convey here is, if you ignore
8 years where things have been off, either because of
9 temperature or thiamine, to depict what the general
10 relationship is between female abundance and egg-to-fry
11 survival, that there is some evidence of density
12 dependence; that the more spawners you have, the lower
13 egg-to-fry survival you will get.

14 So it was appropriate to leave those out just
15 to kind of demonstrate that there is this relationship
16 that occurs independently of these other things that we
17 know have happened in recent years.

18 Figure 10 depicts all the data points,
19 including the other years.

20 Q. Wasn't it a primary criticism that you have of
21 the Martin model that it excludes other factors to
22 focus on temperature?

23 A. I -- I wouldn't put it that way, no.

24 Q. Have you done something similar here? You've
25 excluded other factors to focus on what you wanted to

1 Do you have that in front of you?

2 A. I do.

3 Q. And in the latter part of this paragraph, in
4 particular, but in general, this paragraph is
5 describing a field survey done on the Feather River,
6 correct, in 2004?

7 A. Yeah. That's lines 5 through 8 on page 7? Is
8 that what you're referring to?

9 Q. Yes, I am.

10 Were those -- was that field survey a survey of
11 winter-run Chinook salmon?

12 A. It was not. It was a survey of gravel
13 conditions -- spawning gravel conditions in the Feather
14 River where there's spring-run and fall-run Chinook.

15 Q. The Feather River is not identical to the
16 Sacramento River; true?

17 A. Well, no river is identical to the Sacramento
18 River, but it's similar, like the other rivers I cited,
19 in that it's downstream of a major impoundment that
20 affects gravel quality and quantity. And it's -- it is
21 regulated.

22 So there haven't -- unfortunately, there have
23 not been a lot of studies of this issue in the
24 Sacramento River, though there have been a lot of
25 efforts to enhance gravel, and that's why I'm bringing

1 in all the data that's relevant from other Central
2 Valley systems that are as comparable as we can get to
3 the Sacramento River.

4 Q. Do you agree that these 18-year-old data from
5 the Feather River do not represent current conditions
6 in the Sacramento River today?

7 A. Yeah, I don't -- I don't believe I have
8 represented the data that they are representative of
9 the Sacramento River today. They're just a point of
10 reference due to the lack of other data.

11 And I would add, too, that I did report data
12 that we did collect in the summer in the Sacramento
13 River that would be specific to that.

14 Q. In this same paragraph, you discuss a study --
15 a field survey done in the American River; correct?

16 A. Correct.

17 Q. And same question for that survey. Was that a
18 survey of winter-run Chinook?

19 A. No.

20 Q. I'm going to move to paragraph 21. For the
21 record, paragraph 21 begins on document page 9 and
22 spills over to document page 10. It starts Bates
23 number P_CAVALLLO_24 to P_CAVALLLO_25.

24 Have you found that paragraph?

25 A. Yes.

1 Q. Is it fair to say in this paragraph 21, you're
2 criticizing other scientists for not discussing the
3 existence of a fish hatchery in offering their opinions
4 in this case? In both paragraph 21 and paragraph 22.

5 A. No, I don't think that's accurate.

6 Q. Are you critical of other experts in this case
7 for not analyzing fish hatcheries in offering their
8 opinions?

9 A. I pointed out that it was not something that
10 they had considered and that it needs to be considered
11 because those are a part of the ESA-listed population.

12 Q. Is it your opinion that the existence of a fish
13 hatchery is relevant to how much water should be
14 released from Shasta Dam in this water year?

15 MR. MUELLER: Vague. Incomplete hypothetical.

16 THE WITNESS: I think it's relevant in the
17 sense that I brought it up in my declaration, that
18 we're trying to assess risk of irreparable harm for the
19 population.

20 I don't think it necessarily affects how you
21 manage the river, but it's important when you're
22 assessing the consequences of, you know, the last few
23 years and what happened previously that that context
24 include the operation of this hatchery, which is unique
25 in the Central Valley and actually being managed in a

1 of you; correct?

2 A. Yeah.

3 Q. There is Twitter handle, DeMaxwell@bcavallo.

4 Do you see that?

5 A. Uh-huh.

6 Q. And that is your Twitter handle?

7 A. Yes.

8 Q. And I'm going to read that into the record for
9 those that maybe can't see it:

10 "We found this out this week, that most
11 (approximately 80 percent) of the fish used as
12 winter-run broodstock at LNSFH this year were hatchery
13 returns. Lots of wild fish in the river, but the
14 Keswick trap can't catch them. Relatively easy problem
15 to solve but going unaddressed."

16 Did I read that properly?

17 A. Yes.

18 Q. And did you write that tweet and tweet it on
19 November 6, 2021?

20 A. Yes.

21 Q. Does it concern you that approximately
22 80 percent of the fish used as winter-run broodstock at
23 LSNFH were hatchery returns?

24 A. Yeah, it does concern me. That's why I posted
25 on it. This is something I would like to have --

1 is Mr. Cavallo's declaration, PDF page 24, document
2 page 23, Bates P_CAVALLO_38. Paragraph 46 appears on
3 this page.

4 In paragraph 46, you state that "Estimated
5 ETF" -- or egg-to-fry -- "survival was relatively low
6 in 2020."

7 Are you able to quantify what you mean by
8 "relatively low" in this sentence?

9 A. Yeah. By referring to my Figure 10, the -- the
10 egg-to-fry survival was lower for 2020 than it has been
11 for any year except '14, '15, and '21.

12 Q. So it's fair to say that --

13 A. It was low but not the lowest.

14 Q. Fair to say egg-to-fry survival was not good;
15 true?

16 A. Relative to the other years, yeah, it wasn't --
17 it was lower than you'd expect. I wouldn't say that it
18 was -- you know, again, the context here is evaluating
19 the idea that there was an irreparable harm, and I
20 don't -- I don't agree with that conclusion.

21 MS. WINSOR: All right. I'm going to mark
22 Exhibit 13, I believe.

23 And, Colleen, this will be Twitter 12.

24 (Whereupon, Plaintiffs' Exhibit 13 was marked
25 for identification.)

1 A. Yes.

2 Q. And then below, it says, "Ray Hilborn observed,
3 'Critical peer review has been replaced by faith-based
4 support for ideas and too many scientists have become
5 advocates.'"

6 Have I read that correctly?

7 A. Yes.

8 Q. Do you reject the idea of peer review?

9 A. Not at all.

10 Q. Do you believe peer review is important?

11 A. I do believe it's important.

12 Q. Have your opinions and conclusions in this case
13 have been peer reviewed?

14 A. By definition, no, although some of the things
15 that are touched on in the blog post that are here are,
16 you know, in peer-reviewed papers, mine and others.

17 Q. Do you consider yourself to be a maverick in
18 your community?

19 MR. MUELLER: Vague. Argumentative.

20 THE WITNESS: I consider myself to be somebody
21 that follows the data and is willing to, you know, look
22 at the data and draw conclusions, even if the
23 conclusions aren't necessarily what everybody agrees
24 with; also somebody that will change my mind
25 180 degrees when presented with data that supports --

1 Q. You've expressed a negative view about the NRDC
2 and Golden Gate Salmon, who are the plaintiffs in this
3 case, in this post; correct?

4 MR. MUELLER: Objection. Mischaracterizes his
5 testimony. Mischaracterizes the exhibit.

6 THE WITNESS: Yeah, I don't -- I don't think
7 that characterization is accurate. I mean, what I see
8 is me reaching out, trying to engage on science, and
9 being rebuffed.

10 BY MS. WINSOR:

11 Q. Why were you engaging with the plaintiff in
12 this case on Twitter?

13 MR. MUELLER: Mischaracterizes the --

14 BY MS. WINSOR:

15 Q. Why were you --

16 MR. MUELLER: -- the prior testimony.

17 BY MS. WINSOR:

18 Q. -- engaging with a party in the Pacific Coast
19 Fisheries Association case on Twitter?

20 MR. MUELLER: Lacks foundation. Calls for
21 speculation. Mischaracterizes prior testimony, and
22 mischaracterizes the document, the exhibit itself.

23 THE WITNESS: I'm not an attorney, so I
24 don't -- I don't view things through that lens. I'm a
25 scientist. If there is an opportunity to engage on

1 science in a way that I think could be constructive,
2 then I will do that.

3 BY MS. WINSOR:

4 Q. Is there something that inspired you to respond
5 to this because it was directed at the State Water
6 Contractors?

7 A. Well, the article went down, so I can't see it
8 anymore.

9 Q. Beginning of the feed referenced the State
10 Water Contractors. So my question was if that caught
11 your attention, because the State Water Contractors
12 were mentioned at the beginning of the feed --

13 A. I don't recall.

14 Q. -- if that was part of the reason why you
15 responded?

16 A. Yeah, there's lots of stuff that flies by on
17 Twitter, and 99 percent of it, I don't respond to. And
18 why something grabs me has more to do with what other
19 stuff I'm reading or what's on my mind or...

20 So I don't think there's any meaning to that.

21 MS. WINSOR: Give me just a short break. I
22 think that's it for me, unless your counsel have
23 questions or other folks have questions, but I do want
24 to take just a short break and look at my notes. Maybe
25 a three-minute, five-minute break, and then I'll let

1 STATE OF CALIFORNIA

2
3 REPORTER'S CERTIFICATE

4
5 I, EARLY LANGLEY, a Shorthand Reporter, State
6 of California, do hereby certify:

7 That BRADLEY CAVALLLO, in the foregoing
8 deposition named, was present via Zoom and by me sworn
9 as a witness in the above-entitled action at the time
10 and place therein specified;

11 That said deposition was taken before me via
12 Zoom at said time and place, and was taken down in
13 shorthand by me, a Certified Shorthand Reporter of the
14 State of California, and was thereafter transcribed
15 into typewriting, and that the foregoing transcript
16 constitutes a full, true and correct report of said
17 deposition and of the proceedings that took place;

18 That before completion of the proceedings,
19 review of the transcript was requested.

20 IN WITNESS WHEREOF, I have hereunder subscribed
21 my hand this 21st day of January, 2022.

22
23 
24

EARLY LANGLEY, CSR NO. 3537

25 State of California

Exhibit 3

3.1.1 Cold Water Pool Management

The proposed action proposes to improve cold water pool management so that Shasta Reservoir is generally held higher than under current operations by May 1. This approach will allow Reclamation to better manage the limited cold water resource to improve Winter-run Chinook salmon egg survival. The tiered approach recognizes the substantial influence of hydrology on available cold water and targets a temperature of 53.5°F in the upper Sacramento River above Clear Creek at the Clear Creek California Data Exchange Center temperature gauging station from May 15 to October 31. Reclamation would manage water temperatures based on the following tiers:

- Tier 1 – Targets 53.5°F or lower starting May 15
- Tier 2 – Targets 53.5°F during critical egg incubation period
- Tier 3 – Targets 53.5-56°F during critical egg incubation period; consider intervention measures in lower Tier 3 years
- Tier 4 – Targets 56°F or higher; consider intervention measures

EXHIBIT

6

Population	N	\hat{S}	10-year trend (95% CI)	Recent Decline (%)
LSNFH winter chinook	645	215.0	0.102 (-0.019, 0.222)	2.7
SR winter-run chinook	11125	3708.3	-0.155 (-0.345, 0.034)	67.4

The observed levels of hatchery influence exceed the low-extinction risk criteria met in the previous viability assessment and place the genetic integrity of the population at a moderate risk of extinction (Figure 2; Lindley *et al.* 2007). Since the beginning of hatchery production at LSNFH in 1997, the proportion of SR winter-run Chinook salmon spawning in the river that is of hatchery origin has increased (Figure 2). Prior to 2005, the proportion of LSNFH-origin spawners in the river was between 5% to 10%, consistent with guidelines from the Hatchery Scientific Review Group for conservation hatcheries (Figure 2; California HSRG 2012). However, the hatchery proportion has increased since 2005 and reached ~20% in 2005, 2014, and >30% in 2012. The average over the last 12 years (approximately four generations) is 13% (SD= ±8%) with the most recent generation at 20% hatchery influence, placing the population at a moderate risk of extinction (Table 7; Figure 3).



- # Explore
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Tweet

Ryan Sabalow @RyanSabalow · Jan 3
Everyone knew things were looking awful for the winter run this summer, but the death toll was unprecedented for this unique species of Chinook that survived for eons spawning in frigid spring fed creeks during the middle in California's blast-furnace summers. [#cawater](#)

Dale Kasler @dakasler · Jan 3
Grim #drought death toll: endangered salmon perished in Sacramento River - reporting with @RyanSabalow [sacbee.com/news/californi...](#)

5 13 16

DeMaxwell @bcavallo

Replying to @RyanSabalow

Facts that could also have been reported: 1) 800k juvenile winter are estimated to have survived (more than in '14 and '15), and 2) the winter run conservation hatchery will release 500k+ smolts this month. Egg-to-fry survival was not good, but this is not a year class failure.

10:00 PM · Jan 3, 2022 · Twitter for iPhone

5 Likes



Will Satterthwaite @satterwill · Jan 4
Replying to @bcavallo and @RyanSabalow
Plus ~175K "jump start" fish released in Battle Creek. But also fair to note that 2017 (from 2014 juveniles) escapement lowest on record, 2018 quite low and hatchery-dominated. [Do you have source on 800K? Is that fry-equivalents?]

3

Will Satterthwaite @satterwill · Jan 4
So IMO the real "point" here -- WR escapement in 2024, especially natural-origin, likely to be quite low. How do we make sure that cohort doesn't face similarly poor survival, since there won't be 10K spawners to make up for it?

3 1 3

Cyril Michel @cyriljmichel · Jan 4
This is totally the point. Or to flip it, as a result of good conditions and human efforts, we finally had a great return this year and the potential to double down for even better returns in 2024, but the drought and resource management got in the way

1 2 3

Dalton Hance @TekeliLi · Jan 4
Can we "double down" though given current habitat constraints? Conceptually, there is only so much habitat capacity even in ideal conditions (Battle Creek aside). I'm not sure I know what that is, but perhaps there are estimates out there.

2

Cyril Michel @cyriljmichel · Jan 4
If history is any evidence, it seems there is room for some more growth.

Winter-run Chinook Salmon Returns



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Relevant people

DeMaxwell @bcavallo [Follow](#)
Consulting fisheries scientist, former CA state employee, libertarian, small-business owner, bird hunter, dog lover.

Ryan Sabalow @RyanSabalow [Follow](#)
Duck hunter, dad, provider of shoes for a puppy to chew. Writing about ecological collapses, global plagues and other uplifting topics for The Sacramento Bee.

What's happening

NCAA Men's Basketball · Last night
Sooners at Longhorns



Houston Chroni... · This morning
Years after Hurricane Harvey, Houston homes are in disrepair. Now, the feds want to know why



The New York Ti... · Earlier today
Why some workers are getting all the Covid tests they need



Variety · 3 hours ago
Ronnie Spector, the girl group icon and leader of the Ronettes, has died at 78



Trending with [Ronnie Spector, Be My Baby](#)

Sports · Trending

Paolo
12.5K Tweets

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EXHIBIT
13

Don't miss what's happening

People on Twitter are the first to know.

P_CAVALLLO_00119

Log in

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Exhibit 4



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center
110 McAllister Road
Santa Cruz, CA 95060

December 17, 2021

TO: Kristen Koch, SWFSC Science and Research Director

FROM: Steve Lindley, Fisheries Ecology Division Director

A handwritten signature in cursive script, appearing to read "S. Lindley".

RE: SWFSC Response to SRSC analysis of TDM model used in Martin et al. (2018)

Background: In October 2021 we received a request through the NMFS West Coast Region California Central Valley Office for the code used for estimating T_{crit} , b_t , and background mortality for the Martin et al. (2018) publication. At that time, we had difficulty identifying the exact code that was used for the publication, and as a substitute we developed a Bayesian fitting procedure that produced identical results to the values published in Martin et al. (2018). We felt that this Bayesian approach would meet the stated needs of the SRSC, as it included additional information on the quantification of uncertainty. We have since identified the original code used for the publication and have included it along with this response. If the issues that were raised regarding the Bayesian analysis are still of interest, our response is below. We apologize for any confusion caused by introducing this alternative approach - it was our good faith effort to meet the needs of the initial request.

Overall Response: We have reviewed the concerns of the SRSC and their consultants and our response is detailed below. Overall, out of the various concerns stated by the SRSC, only one has significant merit in relation to the best fit parameters. This was the concern of the hard-coded acceptance/rejection criteria of 5% in the Metropolis-Hastings algorithm. This was an oversight on our part while testing the model code and we have since resolved this (see Point 2 Response). The results of the model fitting procedure, however, were not sensitive to this oversight and the same best fit parameters of T_{crit} and b_t were obtained after correcting the code. Additionally, while updating the code, we included estimation of background survival and carrying capacity in the fitting routine to align with the methods outlined in Martin et al. (2018). In conclusion, the re-fitting procedure outlined in the document/code sent the WCRO-CCVO is consistently estimating T_{crit} and b_t parameter values as published in Martin et al. (2018).

Detailed comments to individual concerns are below. Comments from the SRSC are italicized with responses from the SWFSC presented below each comment.

COMMENT 1a: *The Martin model code uses Bayes theorem to assess the probability of winter run temperature-related survival based on water temperature during incubation and estimates of egg-to-fry survival. The code, however, implements a combination of the logarithmic and multiplicative forms of the Bayes theorem equation which is not mathematically equivalent to the Bayes theorem equation itself, and potentially a misapplication of the theorem.*

Response: We do not agree that Bayes theorem was misapplied and do not agree that we are

CAVALLO_002143

$$P(H|E) = \frac{P(E|H) * P(H)}{P(E)}$$

Where H is the hypothesis being tested (specifically, a mathematical model and its parameter values) and E is the evidence (i.e. data).

When using Bayesian inference the goal is to estimate the posterior probability $[P(H|E)]$ of model parameters (i.e. T_{crit} and b_t in our case). When E is fixed, as in our case, only the numerator is involved in the calculation. Therefore, the posterior probability is calculated as the likelihood $[P(E|H)]$ times the prior $[P(H)]$.

While it is not entirely clear what the SRSC mean by “combination of logarithmic and multiplicative forms Bayes theorem”, in our fitting procedure, we assumed non-informative uniform priors, which equates to $P(H) = 1$; and therefore only the likelihood function is involved with estimating the posterior probability of the two parameters of the model (T_{crit} and b_t). Therefore, whether we treat the $P(E|H)$ as the log-likelihood or likelihood we arrive at the same solution. To make this clear we have updated the code to use likelihood for $P(E|H)$. Results for the best fit parameter were identical as when using log-likelihood.

COMMENT 1b: Metropolis-Hastings accept/reject criterion used in the code was incorrectly implemented by unconditionally accepting proposed values when it decreases probability (the opposite of what it should do), while also accepting otherwise rejected proposals with a fixed 5% probability. The accept-reject criterion is designed to ensure that the Markov chain satisfies a condition called detailed balance. This hard coded, unconditional 5% acceptance breaks the detailed balance condition and adversely affects the mathematical integrity and reliability of estimated posterior values for T_c and θ_T .

Response: This comment appears to have two points. Point 1 is that the model is incorrectly accepting proposed parameter values when probability is decreased, and Point 2 is that the hard coded acceptance criteria of 5% affects the integrity and reliability of the model fit for T_{crit} and b_t . Each point is addressed separately below.

Point 1 Response: SRSC incorrectly state that the fitting procedure chooses parameter values that have lower probability. This confusion may stem from the model code using log-likelihood rather than likelihood when deciding to accept or reject a new parameter set. Using either log-likelihood or likelihood, however, will produce the same result when this mathematical condition is understood and when using non-informative uniform priors. To make this clear, we have re-fit the model using likelihood and came to the identical solution as when using log-likelihood in the accept/reject criteria. If the SRSC statement were true, it would be exceedingly unlikely that the model fitting routine would converge on a single solution as it did.

Point 2 Response: SRSC correctly state that the unconditional acceptance criteria of 5% does not fulfill the conditions of the Metropolis-Hastings sampling theory. This was an oversight on our part while we were testing the code and we thank the SRSC and their consultants for bringing this to our attention. We have corrected this oversight and re-run the modeling procedure. As can be seen in Figure 1, making this update had little effect on the posterior estimate of the both T_{crit} and b_t . Primary changes were that the peak marginal likelihood of T_{crit} shifted slightly up in temperature and converged on a unimodal distribution, while the peak of

b_t was slight reduced. Importantly, however, the parameter set with the highest joint probability density remained unchanged. This last point is important because the fitting routine is maximizing the joint probability based on the data. When using models with more than one parameter, as in our case, it is critical to consider the joint probability and not the marginal probability for inferential purposes.

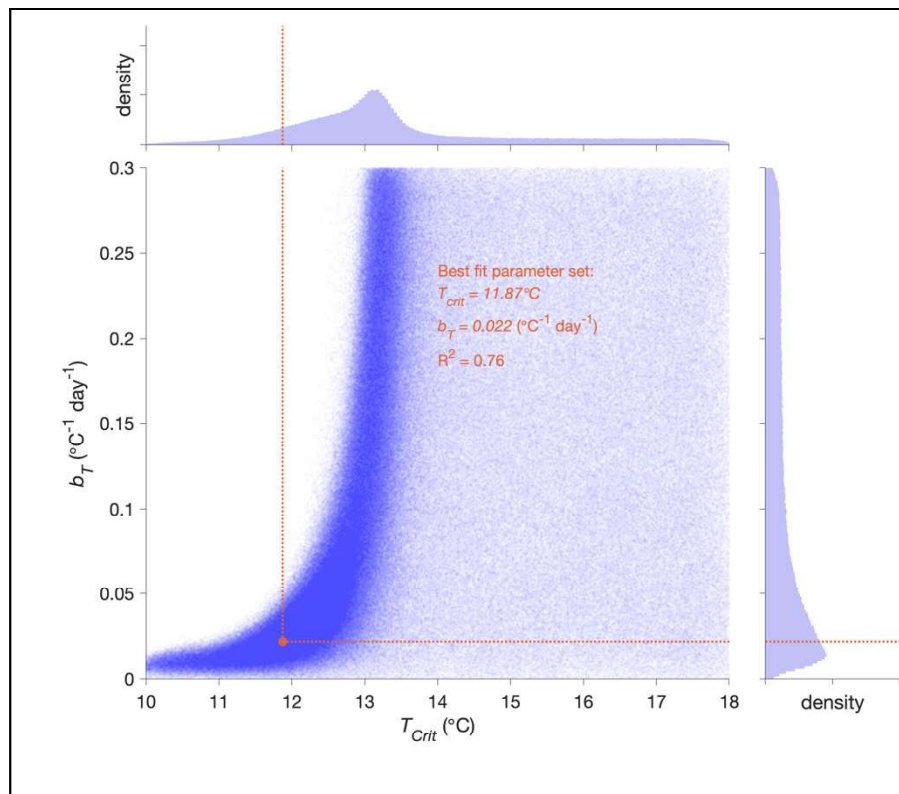


Figure 1: Plot of the joint PDFs for the T_{crit} and b_t parameter fit using 1996-2015 (prior document using 1997-2015 time series) areal red data with the best fit conditions printed. Note, background survival and carrying capacity were left as free parameters to be fit; results of best fit parameter set for background survival and carrying capacity were 36% and 8,989 respectively.

COMMENT 2: Noisy data on egg-to-fry survival estimates. The “best fit” parameter values for T_c (12.06°C/53.7°F) and θ_T (0.0237) were identified in the Martin curve fitting procedure. Independent of the coding errors described above, model fitting results do not support any “best fit” parameter values. Instead, fitting results after correction of the coding errors suggest infinitely many combinations of T_c and θ_T , which effects the validity of attempting to model TDM based on the available data.

Response: There is only one point estimate for the parameter set with the highest likelihood (i.e. the best fit parameter set) in our model fitting procedure. While there is uncertainty in any model fitting procedure and the data used, we do not agree with the SRSC that there are “infinitely many combinations” of the best fit parameters. Rather, further exploration of the joint probability density space indicates a clear peak in the joint distribution of parameters. This is best viewed both in 3D and 2D space highlighting the probability density, where a clear zone, i.e. ‘peak’, of higher density is seen in the 11.8-12.5 °C zone on the x-axis and the 0.02-0.05 °C⁻¹ day⁻¹ zone on the y-axis (Figure 2).

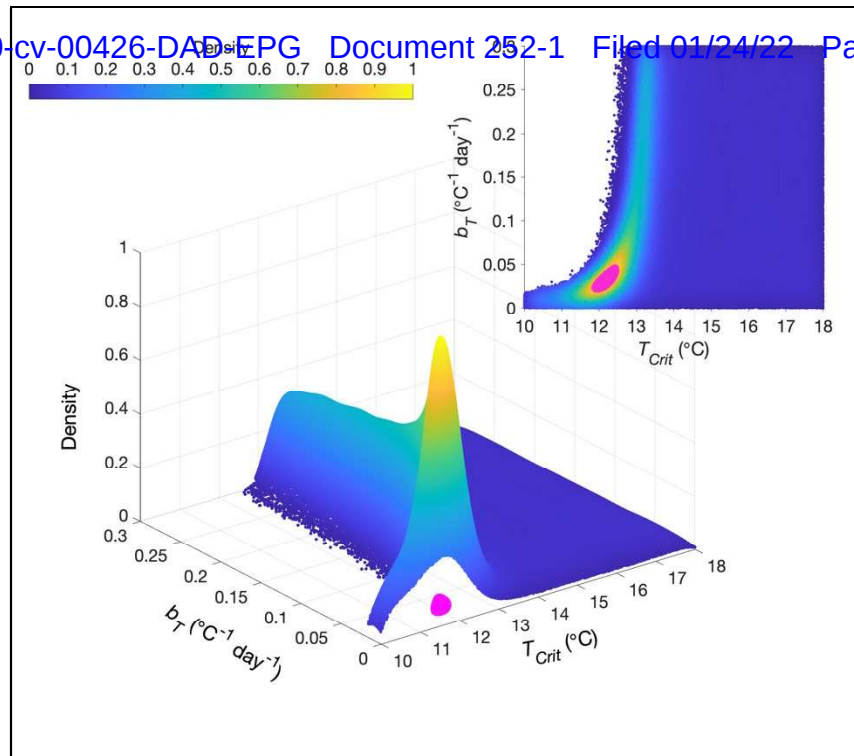


Figure 2: Plot showing the highest density region (in magenta; density ≥ 0.9) for the joint PDFs for the T_{crit} and b_t parameter fit using 1996-2015 (prior document using 1997-2015 time series) areal red data. The figure illustrates a clear zone of the parameters that have a higher density, i.e. 'peak', corresponding to a T_{crit} range of 11.8-12.5 °C and b_t range of 0.02-0.05 °C⁻¹ day⁻¹.

Additional clarifications:

1. We included data for 1996 that we did not have in the original re-fit and we have included background survival and carrying capacity as free parameters to be fit.
2. We have adjusted the dates redds were assumed to be deposited based on the USFW areal redd survey. This was done by assuming redds were deposited 7 days before being observed by the survey. This assumption was made in the original analysis in Martin et al. (2018).

This document provides hindcast estimates of temperature-dependent mortality (TDM) for water year 2021. River temperature was generated using the RAFT model with data assimilation and associated TDM estimates using the SWFSC stage-independent temperature mortality model (Martin et al. 2017). Additionally, since the RAFT model showed a bias in predicting temperature during the peak month of observed spawning in June and July, TDM was also estimated using observed water temperatures at the CDEC gauges (KWK, SAC, CCR, and BSF) and linearly interpolating in space between gauge locations.

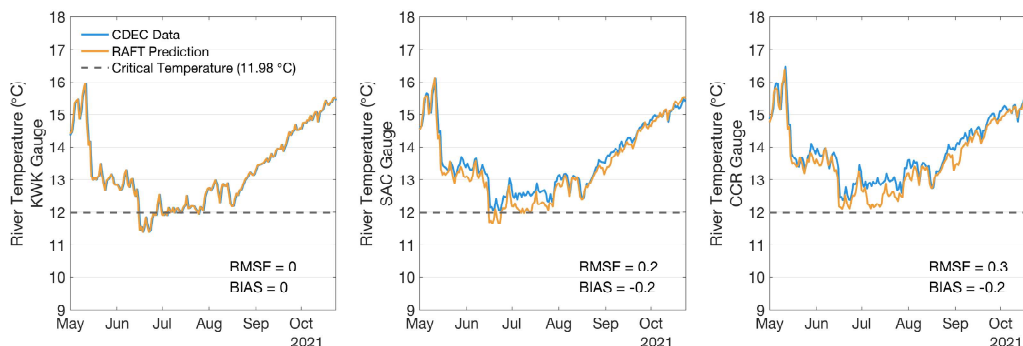


Figure 1: Differences in daily mean river temperature between CDEC data and the RAFT hindcast model at the KWK, SAC, and CCR gauge. Note: RAFT model error statistics, bias and root mean square error (RMSE), are displayed.

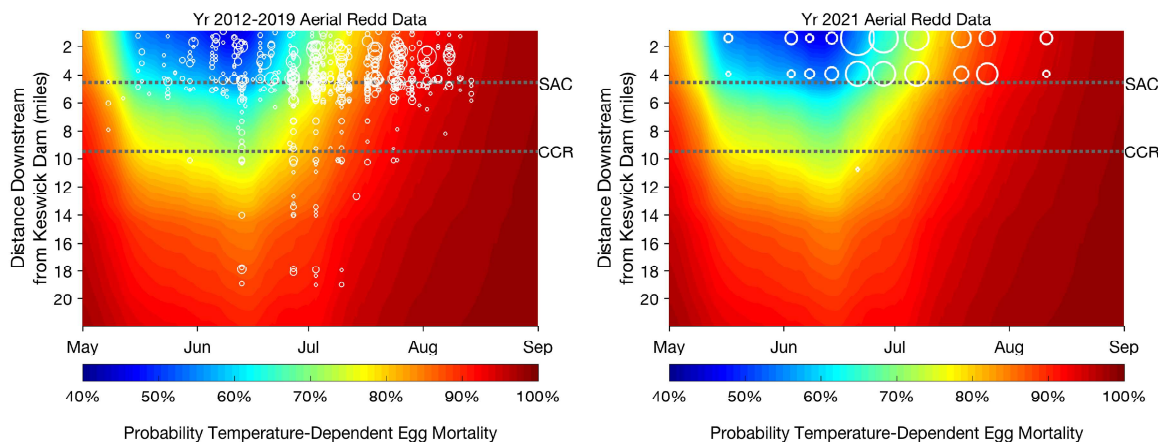


Figure 2: Estimated temperature-dependent egg survival produced by the SWFSC stage-independent model under a 2012-2019 redd distribution (left plot) and 2021 redd distribution (right plot). Note: redd distribution shown as white circles, scaled to the number of redds observed during the aerial survey.

Table 1: Estimated TDM under two spatial and temporal redd distribution using output from the RAFT model and linear interpolation of observed gauge data. TDM estimates were generated for the SWFSC stage-independent temperature mortality model by running the following parameter conditions, $T_{crit} = 11.98^{\circ}\text{C}$, $b_T = 0.023^{\circ}\text{C}^{-1}\text{day}^{-1}$.

Redd distribution (years)	Method to estimate river temperature	Mean Annual TDM (%)
2012-2019	RAFT Model	77
2021	RAFT Model	70
2021	Linear interpolation of observed gauge data	75

Prepared by the Southwest Fisheries Science Center on October, 2021

The temperature-dependent egg mortality model outlined in Martin et al. 2017 was re-fit using a Bayesian approach. Specifically, the posterior probability density function (PDF) of each model parameter (T_{crit} and b_T) was estimated given the model and observations using Metropolis Markov Chain Monte Carlo (MCMC) sampling (Givens and Hoeting, 2012; Metropolis et al., 1953). This approach requires specification of a likelihood function, which assumed that variation of observations from model predictions were normally distributed. Thus:

$$Error = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-u)^2}{2\sigma^2}}$$

where x is the difference between observed egg-to-fry survival at Red Bluff Diversion Dam (logit-transformed) and model predicted values, u is the mean variation (assumed to be zero), and σ is the standard deviation from the mean in variation (assumed to be 1). Each MCMC run comprised three chains of 300,000 iterations with random starting points. Convergence was determined using the Gelman and Rubin diagnostic in the BOA package for R (Brooks and Gelman, 1998; Gelman and Rubin, 1992; Smith, 2007; burn in 5000K, mpsrf <1.1). Uncertainty around parameter estimates was inferred using 95% Bayesian credible intervals (CI) based on the posterior PDF; calculated using the highest probability density function in the BOA package (Smith, 2007). Figure 1 below is a summary of the results that show parameter estimates of $T_{crit} = 12.06$ °C (CI = 10.31-15.28) and $b_T = 0.026$ °C⁻¹ day⁻¹ (CI = 0.001-0.273).

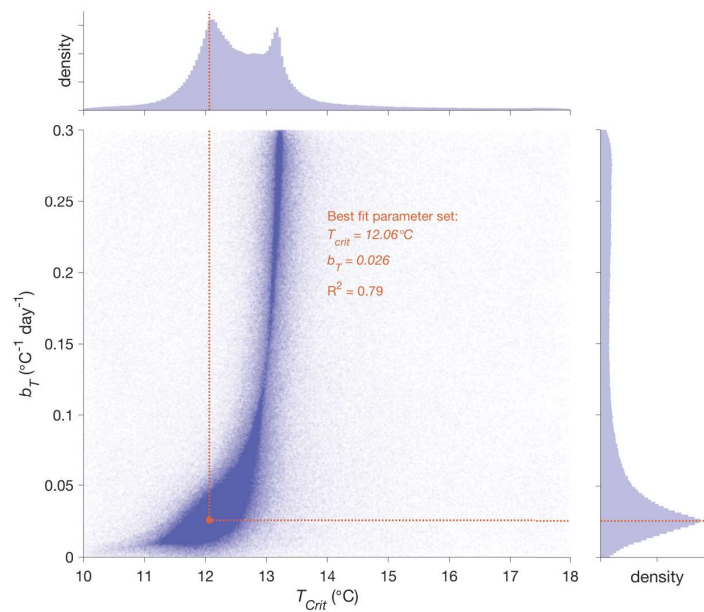


Figure 1: Plot of joint posterior PDFs for the T_{crit} and b_T parameters fit using 1997-2015 areal red data with best fit conditions printed. Note, background survival was set at 36.6% as in Martin et al. 2017.

References:

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Exhibit 5



DEPARTMENT OF WATER RESOURCES

Division of Operations and Maintenance
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

— BUREAU OF —
RECLAMATION

BUREAU OF RECLAMATION

Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

January 18, 2022

Ms. Eileen Sobeck
Executive Director
California State Water Resources Control Board
1001 I Street
Sacramento, California 95814

Subject: Withdrawal of 2022 Temporary Urgency Change Petitioner Regarding Delta Water Quality

Dear Ms. Sobeck,

On December 1, 2021, the U.S. Bureau of Reclamation (Reclamation) and California Department of Water Resources (DWR) jointly submitted a 2022 February through April Temporary Urgency Change Petition (TUCP) to request the California State Water Resources Control Board (State Water Board) consider modifying requirements set forth in Reclamation's and DWR's water right permit Decision 1641. The primary goal of the TUCP was to conserve upstream storage at all Central Valley Project (CVP) and State Water Project (SWP) (collectively Projects) reservoirs should dry conditions persist through the fall and into 2022. The TUCP is one action of a portfolio of early drought actions that Reclamation and DWR considered to proactively manage the CVP and SWP for beneficial uses during a very challenging period.

October and December hydrology showed a marked improvement from conditions experienced in 2021, and storage conditions improved at Oroville and Folsom reservoirs. In fact, Folsom is currently in flood operation status. However, storage levels at Shasta and Trinity reservoirs continue to be low with relatively lower runoff projections than seen in the central and southern watersheds. Within this context, Reclamation and DWR reviewed the request for the TUCP to determine if it would benefit Shasta and Trinity reservoirs by helping to preserve storage. Although the requested TUCP may result in some storage conservation under certain dry hydrology, the forecasted conditions of 2022 do not appear that this storage benefit would be in either Shasta or Trinity reservoirs. These reservoirs are not expected to be relied upon for meeting Delta outflow and/or salinity requirements in the February through April period due to the expected higher releases from Folsom, and Oroville, if needed, and/or additional systemwide runoff in general. Reclamation and DWR analyzed this expected benefit under very conservative hydrologic assumptions from the January runoff forecast. As a result, Reclamation and DWR no longer believe there is an urgent need for the February through April modifications contained in the 2022 TUCP. Because of this, Reclamation and DWR are withdrawing the TUCP.

Reclamation and DWR continue to conduct operational studies and plan for a resumption of dry conditions. If those conditions occur, then modifications may be needed to protect upstream storage levels. If future modifications are needed, a separate petition will be filed with supporting information. Reclamation and DWR look forward to cooperatively working with the State Water Board and its staff during this challenging period to manage Delta water resources for the benefit of the people and natural resources of the state of California.

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Exhibit 6

Biological Opinion on Long-Term Operation of the CVP and SWP

WCRO-2016-00069

Source of Uncertainty	Information from biological assessment and Supplemental Reclamation Submissions	How NMFS Applied Assumptions to Address Uncertainty
	Anderson model is based on previous (Rombough 1994) analyses, but has not completed a published peer-review process. Martin model is based on a meta analysis of fishery information and has completed the peer-review process.	Considered external reviews and field-testing in assigning weight of evidence applied to methods according to categories identified in Section 2.1 Analytical Approach. Acknowledges the uncertainties and needs for additional research identified in review of Martin et al. (2017) but also that it is a “realistic representation of temperature effects on eggs” (Gore et al. 2018).
Uncertainty During Real-Time Implementation of Proposed Action	Annual and seasonal uncertainties with precipitation and runoff, air temperatures, and cloud cover.	NMFS considers that the water temperature that fish experience may exceed 53.5°F, or other temperatures as described in other tiers.
	Uncertainty about forecasted temperature control device performance.	NMFS considers that the water temperature that fish experience may exceed 53.5°F, or other temperatures as described in other tiers.
	Assumptions about actual accretions and depletions in upper Sacramento River may not be accurate	NMFS considers that the water temperature that fish experience may exceed 53.5°F, or other temperatures as described in other tiers.

A specific example of uncertainty related to real-time implementation of the proposed action is the exposure risk to temperature conditions during summer temperature management. For current operations, Reclamation takes a conservative approach to building storage that starts by targeting minimum flows in the fall and winter until either the reservoir nears the flood control elevation or another requirement, such as Delta water quality, requires increased releases of stored water. With this approach, Reclamation develops a monthly Keswick Dam release forecast using the Shasta end of September carryover storage and various historical hydrologies. The current operations include an interagency workgroup that provides input to Reclamation on taking additional actions, including export curtailments, if necessary, to conserve storage and other protections/measures. Similarly, for the proposed action action component fall and winter refill and redd maintenance, Reclamation is proposing to set minimum fall flows according to Shasta end of September carryover storage.

Reclamation will coordinate under all conditions, and seek technical assistance from NMFS and the FWS regarding species intervention measures only in the driest of the four proposed Tiers (i.e., March 90 percent exceedance runoff forecast indicate May 1 Shasta storage of less than 2.5 MAF). In contrast, the existing process includes monthly consultations between NMFS and Reclamation from the February forecast through the issuance of the Sacramento River temperature management plan in May. These consultations provide NMFS with the opportunity to provide information regarding biological criteria for spring operations of Keswick Dam

On August 2, 2016, Reclamation requested using the adaptive management provision in the NMFS 2009 Opinion related to Shasta Reservoir operations. The basis for this request included recent, multiple years of drought conditions, new science and modeling, and data demonstrating the low population levels of endangered winter-run Chinook salmon and threatened CV spring-run Chinook salmon. In response, Reclamation implemented a 2017 pilot approach that applied new science on the thermal tolerance of Chinook salmon eggs (Martin et al. 2016) and which was designed to efficiently utilize Shasta Reservoir's limited supply of cold water by basing the spatial distribution of protective temperatures on the within-season spatial distribution of winter-run Chinook salmon redds. The intent was to provide daily average water temperatures of 53°F or less to the Clear Creek gauging station as a surrogate for the furthest downstream redds. The 2009 RPA requirement was a daily average temperature of 56°F or less at compliance locations between Balls Ferry and Bend Bridge, which are not based on the within-season redd distribution. Under the 2017 pilot approach, along with one of the wettest years on record (in water year 2017), resulted in an estimated 44 percent egg-to-fry survival, one of the highest estimates on record. The pilot approach was implemented in 2018 and is also being implemented in 2019. In July 2019, CDFW aerial redd surveys indicated redd distribution was further downstream than the targeted temperature management location at CCR. Per the request of the fish agencies, and as a result of Reclamation's temperature modeling that indicated the operation was feasible, on August 7, 2019, Reclamation initiated temperature management to target 53.5°F at the Airport Road location. The effects of Sacramento River water-temperature management for listed spring-run and winter-run Chinook salmon eggs on the growth rate of juvenile green sturgeon have been modeled, and there was relatively little impact on the growth rate of the species (Hamda et al. 2019).

Clear Creek – 2009 RPA Action I.1.4 Spring Creek Temperature Control Curtain - required Reclamation to replace the Spring Creek Temperature Control Curtain in Whiskeytown Lake by 2011, with the objective to reduce adverse impacts of project operations on water temperature for listed salmonids in the Sacramento River. The curtain was replaced in 2011. In addition, the Oak Bottom Temperature Control Curtain, which is located at the upper end of Whiskeytown Reservoir and intended to enhance coldwater transport from the upper end of the reservoir to the lower reservoir outlets, including Spring Creek Tunnel and Whiskeytown Dam, was replaced in May of 2016. Having both temperature curtains functioning together in tandem enhance cold-water availability in the Spring Creek Tunnel and Whiskeytown Dam outlets, and Reclamation's Technical Service Center is currently evaluating their performance, with a final report expected in 2019.

RPA Action I.1.5 Thermal Stress Reduction - required Reclamation to reduce thermal stress to over-summering CVC steelhead and CV spring-run Chinook salmon during holding, spawning, and egg incubation by managing Whiskeytown releases to meet a daily water temperature of (1) 60°F at the Igo gauge from June 1 through September 15, and (2) 56°F at the Igo gauge from September 15 to October 31. Reclamation has operated releases for temperature management since implementation of the 2009 RPA action, though criteria was not met in some years.

The 2009 RPA action also required Reclamation, in coordination with NMFS, to assess improvements to modeling water temperatures in Clear Creek and identify a schedule for making improvements. In the NMFS, 2011 amendment to the NMFS 2009 Opinion, the need to "explore options to avoid non-compliance with the RPA" was specified for this action. To date, an assessment of and schedule for making improvements to modeling water temperatures in Clear

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Water Year Type	Loss Under Current Operating Scenario	Loss Under Proposed Action	Proposed Action minus Current Operating Scenario	Change
Below Normal	10,188	12,056	1,867	18%
Dry	9,743	12,478	2,735	28%
Critical	5,158	7,107	1,949	38%

Table 90. Estimated annual loss of California Central Valley steelhead at the export facilities by month for all water types based on the salvage-density method.

Water Year Type	Loss Under Current Operating Scenario	Loss Under Proposed Action	Proposed Action minus Current Operating Scenario	Change
October	40	60	20	48%
November	14	16	2	16%
December	43	38	-5	-12%
January	1,447	1,533	86	6%
February	1,756	1,809	54	3%
March	1,995	1,880	-116	-6%
April	604	1,528	923	153%
May	354	822	467	132%
June	269	267	-1	0%
July	31	29	-1	-4%
August	3	3	0	-1%
September	4	4	0	2%

NMFS put the combined CCV steelhead loss in a population context (see full caveats in Section 2.5.5.8.3.1) by expressing the estimated annual combined loss as a percentage of the steelhead population in the Delta. These results should be considered a coarse screening level analysis due to limitations of the salvage-density method itself (limited historical time-frame of loss; relatively simple weighting of loss by export changes and no other operational factors) and use of the average annual modeled loss rates (over the 15-year data period) scaled to both low and high population estimates. Since it is likely that annual observed loss in a particular year is correlated with population size, use of the average loss rate likely overestimates the population effect in a low-population year, and underestimates the population effect in a high-population year.

- For junctions on both the Sacramento River and San Joaquin River, "...a -5,000 cfs Old and Middle River reverse flow limit provides protection compared to more negative Old and Middle River reverse flow levels that would exert a larger influence on flow routing at distributary junctions and, thus, on juvenile routing and survival." However, the salmonid scoping team "did not conclude at what precise level of Old and Middle River flow more negative than -5,000 cfs exports would begin to affect distributary flows, juvenile routing, and survival", and also noted some technical disagreement on this point.
- Within the interior channels of the South Delta, "...the -5,000 cfs Old and Middle River flow is predicted to be less effective at preventing or minimizing export effects on juvenile routing at junctions and residence times within the interior channels of the South Delta than in the mainstems of the Sacramento River and San Joaquin River...because the export-driven influence on hydrodynamic conditions at a given Old and Middle River flow level increase with proximity to the export facilities.
- The salmonid scoping team noted that there is "inadequate empirical evidence from fish tracking studies to more precisely evaluate junction-specific relationship between distributary flow changes and changes in fish routing and survival. As a results there is uncertainty in relating specific Old and Middle River reverse flow thresholds to overall through-Delta survival.
- The salmonid scoping team concluded that "...route selection is generally proportional to the flow split at channel junctions, and the effect of exports on route selection is strongest at the junction leading directly to the export facilities (i.e., head of Old River)."

We can evaluate some of the conceptual model mechanisms described above based on modeling provided in the ROC on LTO biological assessment. The salvage density modeling shows that salvage and associated loss increases with exports during months when listed salmonids are present in the Delta. Therefore, if fish are present in the vicinity of the export facilities in the south Delta during a time that storm flex export operations are implemented, NMFS concludes there will be an increase in the number of fish entrained into the salvage facilities above that which would have been seen with no increases in exports. Furthermore, since listed salmonids tend to start migrating downstream in response to elevated flows in the Sacramento River basin and San Joaquin River basin waterways, there is a high probability that more fish will be present in the Delta exactly when the CVP and SWP increase their exports. Besides the fish entering the Delta on the elevated storm flows, listed salmonids (especially winter-run Chinook salmon) may already be present in the Delta due to migration earlier in the year. This overlap in fish presence and the potential for combined exports to reach 14,900 cfs can result in increased entrainment risk as a result of the potentially very negative Old and Middle River flows. Reclamation has committed to a risk assessment before implementing a storm flex export operation which could limit risks. Salmonid Scoping Team (2017a) concluded that "...route selection is generally proportional to the flow split at channel junctions, and the effect of exports on route selection is strongest at the junction leading directly to the export facilities (i.e., Head of Old River)." Any fish that originates in the San Joaquin River basin will be at a high risk of entrainment due to the routing of fish through Old River from the Head of Old River. The fish that stay within the main stem San Joaquin River channel at the head of Old River may enter the interior Delta at other junctions and be exposed to the increased foot print of the altered hydrodynamics created by the high level of exports in the channels leading to the pumps. Triggers based on loss density for unclipped steelhead are less likely to happen under the high export condition as greater volumes

2000 which restored passage to approximately 12 miles of holding and spawning habitat. Other improvements on Clear Creek have included spawning gravel augmentation, floodplain restoration and side channel restoration projects. On the upper Sacramento River, Reclamation and others have been restoring side-channel rearing habitat and augmenting spawning habitat with spawning gravels. On Battle Creek, the Battle Creek Salmon and Steelhead Restoration Project has been improving fish passage and similar actions have been undertaken on Mill Creek and Butte Creek. On Butte Creek, a combination of fish passage improvements and flow and temperature management actions have resulted in significant increases in the population. Reclamation, through the CVPIA, has funded fish screening projects on the largest water diversions in the Sacramento Valley.

The most significant effects of the proposed action on individuals from this ESU are expected to be those of water temperature management in the upper mainstem Sacramento River, spring pulse flows, operation of the Delta Cross Channel gates, and CVP/SWP south Delta export operations. The likely effects on individuals and the viability of populations in the affected diversity groups are reviewed in the following sections.

11.3.1 Water Temperature Management in the Upper Sacramento River

Reclamation's management of the cold water pool in Shasta Reservoir, developed to protect the redds of winter-run Chinook salmon, is expected to result in mortality of some eggs and fry of spring-run Chinook salmon between Keswick Dam and the Clear Creek gauge. Temperatures will exceed the lethal temperature of 53.5°F in 76 percent of days during August through October under Tier 1, 80 percent of days under Tier 2, 97 percent of days under Tier 3, and 100 percent of days under Tier 4. NMFS assumes that this is a conservative metric (i.e., overestimates likelihood of egg and fry mortality) because these temperature exceedances would be observed at the Clear Creek gauge at furthest downstream point of winter-run Chinook salmon spawning where the mainstem temperatures are influenced by inflow from warmer tributaries (i.e., many fish will likely spawn further upstream where temperatures would be better). Reclamation therefore proposes to provide flows that result in 53.5°F at the Clear Creek gauge when the working group determines, based on real-time monitoring, that 95 percent of winter-run Chinook salmon eggs have hatched and their alevins have emerged, or on October 31st, whichever is earlier. Although designed to protect redds in the downstream portion of the spawning area, NMFS expects that this action also will reduce the risk of temperature dependent mortality for spring-run Chinook eggs in the upper mainstem spawning area. Considering that the spawning area used by spring-run Chinook salmon overlaps both temporally and spatially with that of fall-run Chinook salmon, it is difficult to estimate the magnitude of the benefit that water temperature management will have on the numbers and productivity of this dependent spring-run population, but NMFS expects it will provide some support for the numbers, productivity, and spatial distribution of the northern Sierra Nevada diversity group.

11.3.2 Spring pulse flows in the mainstem Sacramento River

Reclamation's proposal to store cold water in Lake Shasta to protect winter-run Chinook redds will reduce flows in the mainstem Sacramento River during spring when juvenile spring-run Chinook are present. Reclamation therefore proposes to release pulsed flows that improve migration habitat for this ESU when the projected total storage in Shasta Reservoir on May 1st indicates that sufficient cold water will be present for both the pulses and summer cold water